Biodegradable Packaging from chitinolytic fish wastes: the FISH4FISH project

Dr. Daniele Spinelli
The global production of synthetic plastics, which are carbon-based polymers such as polypropylene, polyethylene, polyvinyl chloride, polystyrene, nylon, and polycarbonate, has continuously increased.

Approximately 360 million tons of plastics were produced in 2018.

Conventional plastic play a pivotal role in modern society.
The «Shell Biorefinery» concept

Crustacean shells production:
6 to 8 million tons each year of waste crab, shrimp and lobster shells are produced globally in the food processing industry.

Shrimp production (2016)
Wild catches = 37%
Farming shrimp = 57%

In a crab mass meat accounts only for 40%

The «Shell Biorefinery» concept

- Astaxanthin (high value pigment)
- 1-2% extractable fats with a high content of unsaturated fatty acids

«Biorefinery» = the conversion of raw materials into a product with a higher value

The «Shell Biorefinery» concept

N-acetylglucosamine chain

Chitin

Chitosan

Chitooligosaccharide

R= H or Ac  n= 0 to 8
Project target

- Active packaging biocomposite to reduce microbial spoilage to enhance fish shelf-life
- High performance packaging (mechanical, thermal and barrier properties, increase the shelf life of fish)
- Biodegradable and compostable to be used as fertilizer and microbial preservative for plants
The FISH4FISH project in a nutshell

- Chitosan obtained with different MWs and de-acetylation degree

Chitosan production

- Crushed exoskeleton
- Deproteinization Demineralization
- Purification
- Dried chitosan

The FISH4FISH project in a nutshell
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➢ COS - low molecular weight chitosan oligomers with improved antimicrobial activity against Gram+ and Gram- bacteria and fungi
Lignin - waste from pulp and paper and bio-refinery industry

Functionalized lignin nanoparticles prepared by the nanoprecipitation technology
No toxic compounds have been added to the final biocomposite formulation

Fertilizer and microbial preservative for plants
The FISH4FISH project in a nutshell

- Reduction of plastic pollution from coasts and seas, preservation of marine environment (2018 blue economy report, Horizon Europe Mission – Healthy Ocean)
- New value to the fish industry waste
- Enhance competitiveness of fish-processing industry
- Reduction of food waste
- Contribution to soil health for a high quality compost (Horizon Europe Mission – Healthy Soil and Food)
- Implementation of SDGs
Acknowledgements

FISH4FISH PARTNERS

Project Coordinator

http://fish4fish.dbcf.unisi.it
Fish4Fish Project EU-Emff- Blue Economy
@Fish4fishP
info.f4f@unisi.it

Project video:
https://www.youtube.com/watch?v=fIxRUeZ0yRw
Contacts:

Prof. Rebecca Pogni - coordinator
rebecca.pogni@unisi.it

Dr Daniele Spinelli – WP leader
chemtech@tecnotex.it